

REMARKS/ARGUMENTS

Claims Status

Claims 1, 3-10, 14, 15, 17 and 19-24 are pending. Claims 1, 3, 5-10, 14, 15, 17 and 19-21 are currently amended. Claims 2, 11-13, 16 and 18 are canceled without prejudice. Claims 4 and 22 remain in their original and previously presented forms, respectively. Claims 23 and 24 are added. Claim 1 is amended to include the subject matter of original claims 2 and 11-13. The remaining amended claims are amended pursuant to the amendments to independent claim 1. New claim 23 finds support in the specification: page 9, lines 23-24 and 29-31. New claim 24 finds support in the specification: page 1, lines 3-8. No new matter is believed to have been entered.

§112, 2nd paragraph, Rejection

Claims 1, 9 and 18 are rejected for the indefinite use of trademarks in the claims. As the trademarks have been removed from claims 1 and 9, and claim 18 has been canceled, Applicants submit that this rejection has been obviated. Accordingly, Applicants respectfully request withdrawal of this rejection.

§102 Rejections Over Kurata, Sato and Tsuchiya

The claimed invention has been rejected under 35 U.S.C. §102(b) as anticipated by Kurata (US 2005/0181609), under 35 U.S.C. §102(b) as anticipated by Sato (US 2006/0042502), and under 35 U.S.C. §102(b) as anticipated by Tsuchiya (US 6,530,968). Applicants respectfully traverse these rejections.

At the outset, Applicants point out that the U.S. publication of Kurata does not qualify as prior art against the current application under any of §102(a), §102(b) and/or §102(e). However, since the WIPO publication of Kurata (i.e., WO 03/094216, published November

13, 2003 in Japanese) does qualify as prior art under §102(a) and §102(b), Applicants traverse the Kurata rejection *with respect to the WIPO publication*. In addition, Applicants point out that Sato only qualifies as prior art against the current application under §102(e), not §102(b) as alleged in the Office Action.

With respect to the anticipation rejections over Kurata, Sato and Tsuchiya, Applicants provide the following remarks.

The claimed invention relates to an aqueous solution for post-etch residue removal having a reduced etching rate, said solution comprising (in part) (a) at least one hydroxycarboxylic acid in an amount of 0.1-30%, (b) hydrogen peroxide in an amount of 0.1-10%, and (c) at least one corrosion inhibitor selected from the group consisting of imidazoline compounds (see claim 1).

While Applicants recognize that each of (a), (b) and (c) have been *individually* rejected as anticipated, based on the individual claims reciting these features, Applicants submit that none of Kurata, Sato and/or Tsuchiya disclose or suggest the claimed aqueous solution having a *combination* of features (a), (b) *and* (c).

Furthermore, Applicants note that the present invention relates to aluminum technology whereas Kurata, Sato and Tsuchiya relate to copper technology using the damascene method (see e.g., [0004]-[0006] of Kurata). In order to understand the differences in these two technologies, Applicants provide the following remarks.

In the aluminum technology, like the present invention, after deposition of the conducting metal layer and application and development of the photoresist, the conducting metal layer is dry-etched in order to obtain an interconnect line structure (see e.g., [0003]-[0014] of published specification). The interconnect lines consist of aluminum and copper wherein the copper content is below 0.5% (see [0002] of published specification). During the

dry-etching, post-etch residues remain on the substrate. The object of the present invention (i.e., the claimed aqueous solution) is to remove said residues.

In contrast, in the copper technology, like Kurata, Sato and Tsuchiya, the dielectric layer is structured and then the vias and trenches are filled with the conducting material. In these references, the conducting material is copper. After the deposition, the excess copper has to be removed from the substrate by chemical-mechanical planarization (CMP) and the substrate has to be cleaned afterwards. As such, Applicants point out that Kurata, Sato and Tsuchiya relate to “slurries” for CMP.

Accordingly, since “slurries” are particle dispersions and not “solutions,” and since the aluminum technology and the copper technology differ with respect to types of substrates and kinds of residues to be removed, Applicants submit that none of the *slurries* of Kurata, Sato and/or Tsuchiya of the *copper technology* anticipate the *aqueous solution* of the claimed invention of the *aluminum technology*. Furthermore, Applicants submit that none of Kurata, Sato and Tsuchiya render obvious the claimed invention for at least the following additional reasons.

As mentioned above, none of these references disclose or suggest the claimed aqueous solution having a *combination* of features (a), (b) and (c). The present inventors however, have surprisingly found that aqueous solutions comprising (a), (b) and (c) are able to remove the post-etch residues remaining after the dry-etching in one step.

In contrast, Kurata, Sato and Tsuchiya are related to CMP slurries for the copper technology. Accordingly, a corrosion inhibitor and a hydroxycarboxylic acid would have effects on the copper substrate and the residues to be removed (e.g., mostly particles and metal ions) in Kurata, Sato and/or Tsuchiya which is **not comparable** with the aluminum substrate and the residues to be removed (e.g.,) in the present invention. Furthermore, Applicants note that the hydroxycarboxylic acids of the present invention (e.g., citric acid),

do not act as a metal oxide dissolver as in the cited references, but rather as an auxiliary agent for removing polymer residues and as an inhibitor for the metal surface.

Accordingly, in light of the foregoing, Applicants submit that none of Kurata, Sato and/or Tsuchiya, alone or in combination, disclose or suggest the claimed aqueous *solution* having a *combination* of features (a), (b) and (c) for use in the *aluminum technology*.

§102(b) Rejection Over Mizuta

The claimed invention has been rejected under 35 U.S.C. §102(b) as anticipated by Mizuta (US 2007/0235061). However, Applicants submit that this reference does not qualify as prior art against the current application for at least the following reasons.

The current application has a U.S. filing date of January 18, 2007, and an effective U.S. filing date of March 10, 2005, since the current application is the national stage entry of a PCT application (in other words, a 371 application). Mizuta has a U.S. publication date of October 11, 2007, which is *after* both the U.S. filing date and the effective U.S. filing dates of the current application. Accordingly, the U.S. publication of Mizuta does not qualify as prior art against the current application under §102(a) or §102(b).

Mizuta, being a U.S. national stage entry of a PCT application, was also published as WO 2005/040324 on May 6, 2005, which is *after* the effective U.S. filing date of the current application. Accordingly, the WIPO publication of Mizuta does not qualify as prior art against the current application under §102(a) or §102(b).

Furthermore, since the WIPO publication was published in Japanese, not English, neither the U.S. publication nor the WIPO publication of Mizuta qualifies as prior art against the current application under §102(e).

In light of the foregoing, Applicants respectfully request withdrawal of the rejection over Mizuta.

Conclusion

For the reasons discussed above, Applicants submit that all now-pending claims are in condition for allowance. Applicants respectfully request the withdrawal of the rejections and passage of this case to issue.

Respectfully submitted,

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